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Chang et al.

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(54) **BACK PLATE, BACKLIGHT MODULE USING THE BACK PLATE AND DISPLAY DEVICE USING THE SAME**

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(30) **Foreign Application Priority Data**

Jul. 12, 2013 (TW) ..... 102125061 A

(51) **Int. Cl.**

G09F 13/04	(2006.01)
G09F 13/08	(2006.01)
G02F 1/1335	(2006.01)
G02F 1/1333	(2006.01)

(52) **U.S. Cl.**

CPC ***G02F 1/133608*** (2013.01); ***G02F 1/133308*** (2013.01); *G02F 2001/133314* (2013.01); *G02F 2001/133328* (2013.01)

(58) **Field of Classification Search**

CPC G02F 1/133608; G02F 1/133602; G02F 1/133308; G02F 2001/133328; G02F 2001/133314

See application file for complete search history.

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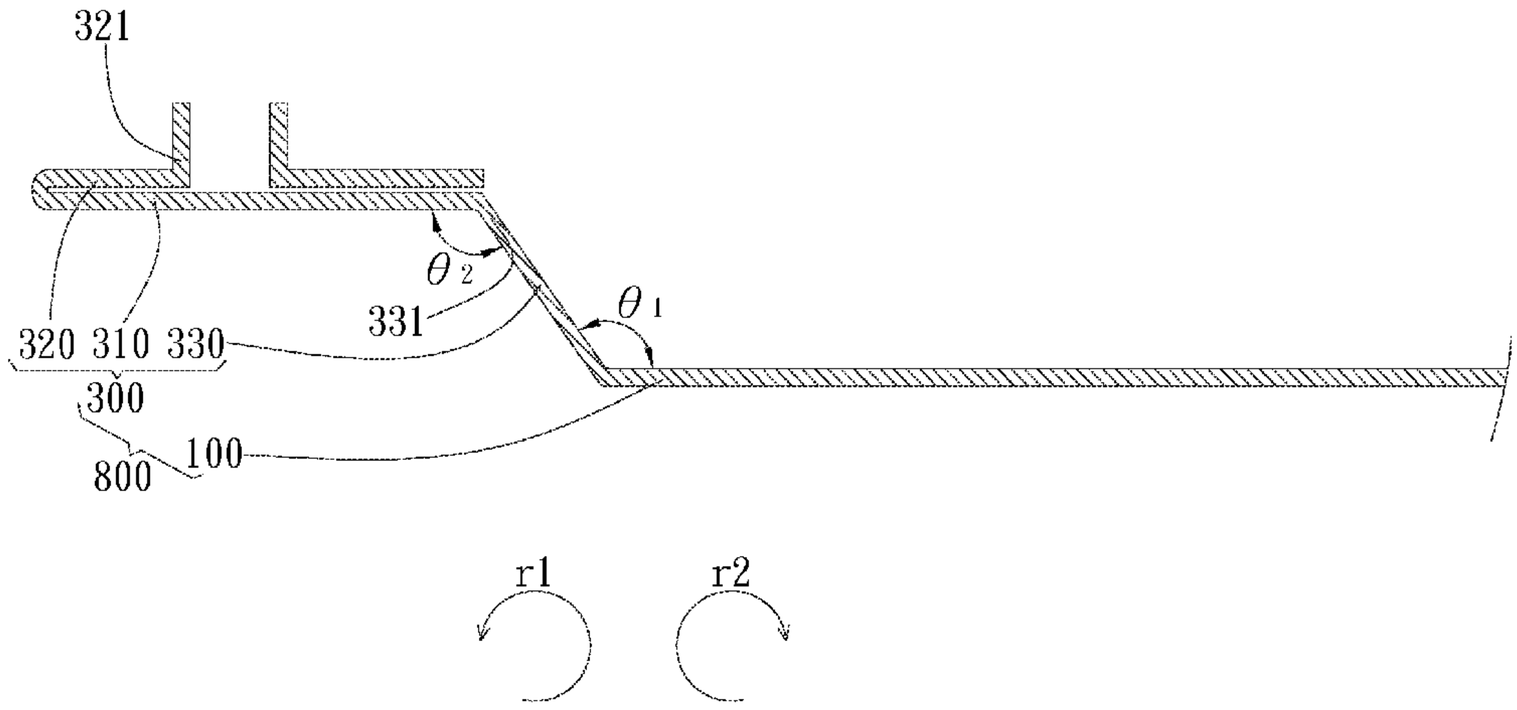
(57) **ABSTRACT**

The present provides a back plate including a plate and a side wall. The side wall extends out from an edge of the plate, wherein the side wall includes a wall body, a first bending sheet, and a second bending sheet. The first bending sheet is formed by bending outward from a top end of the wall body along a first rotating direction. The second bending sheet is formed by bending an end of the first bending sheet that is away from the top end of the wall body inward along a second rotating direction contrary to the first rotating direction, wherein at least a portion of the second bending sheet overlaps the first bending sheet. The second bending sheet includes a fixing part disposed on a face of the second bending sheet that faces away from the first bending sheet.

15 Claims, 8 Drawing Sheets



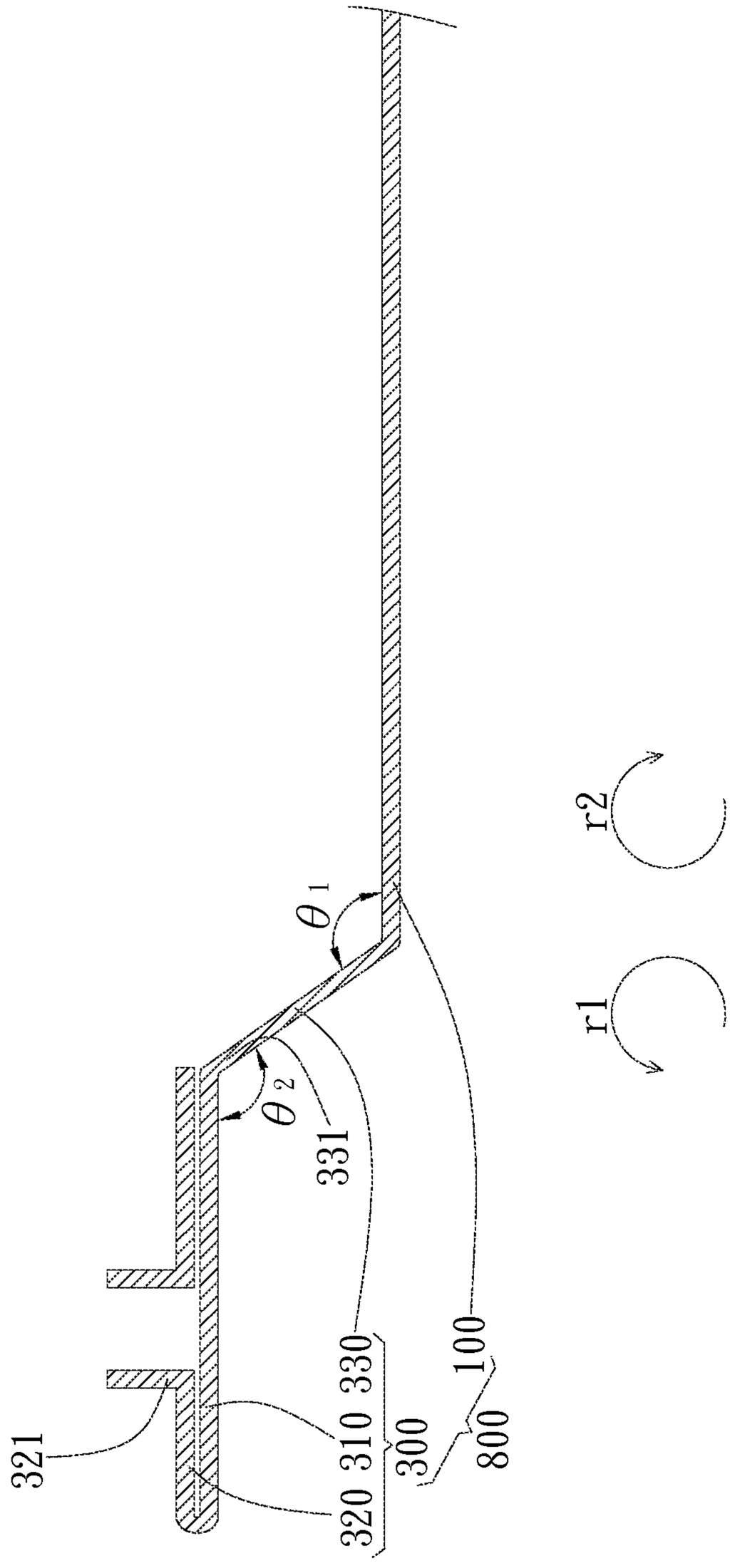


FIG. 1

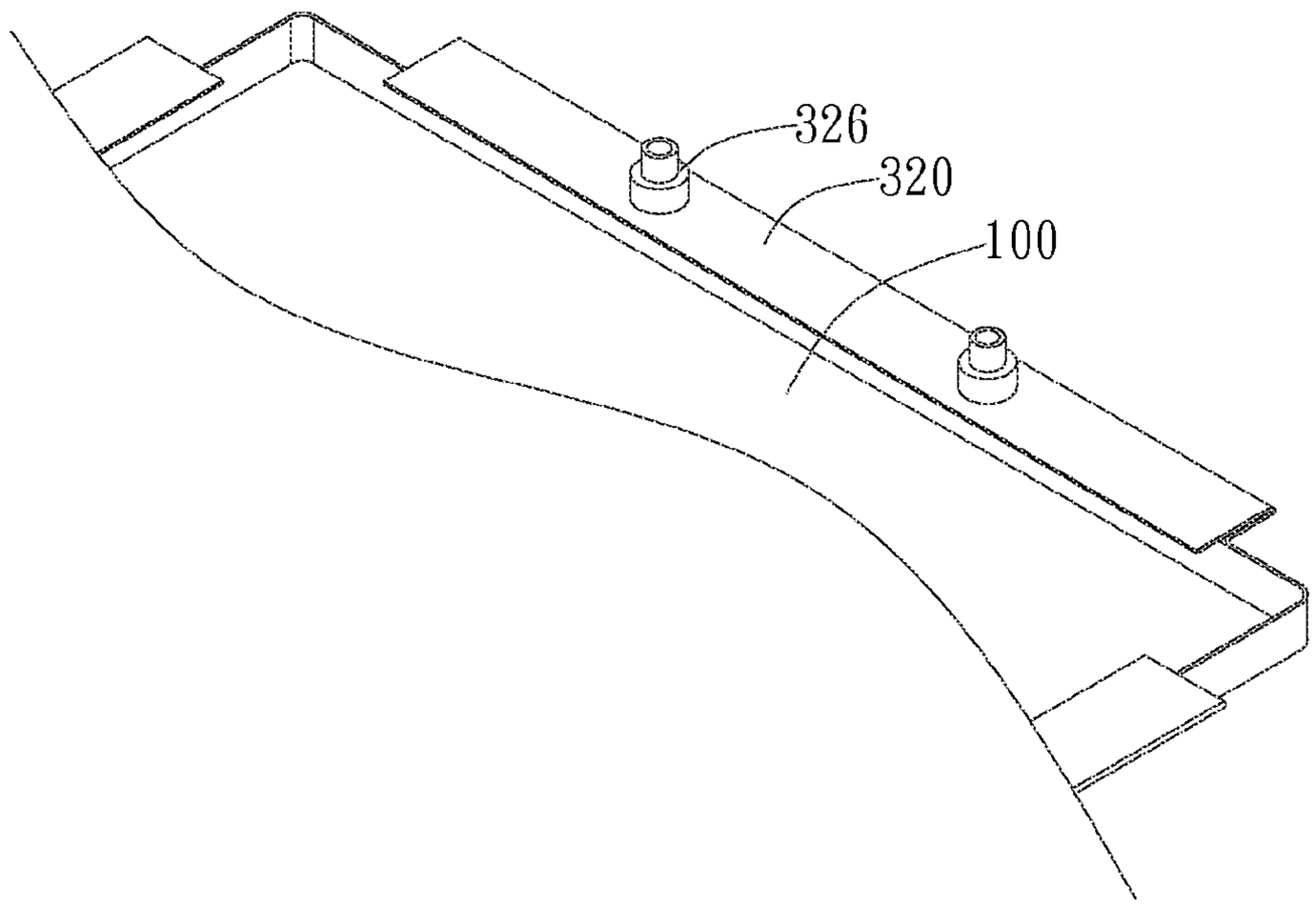


FIG. 2A

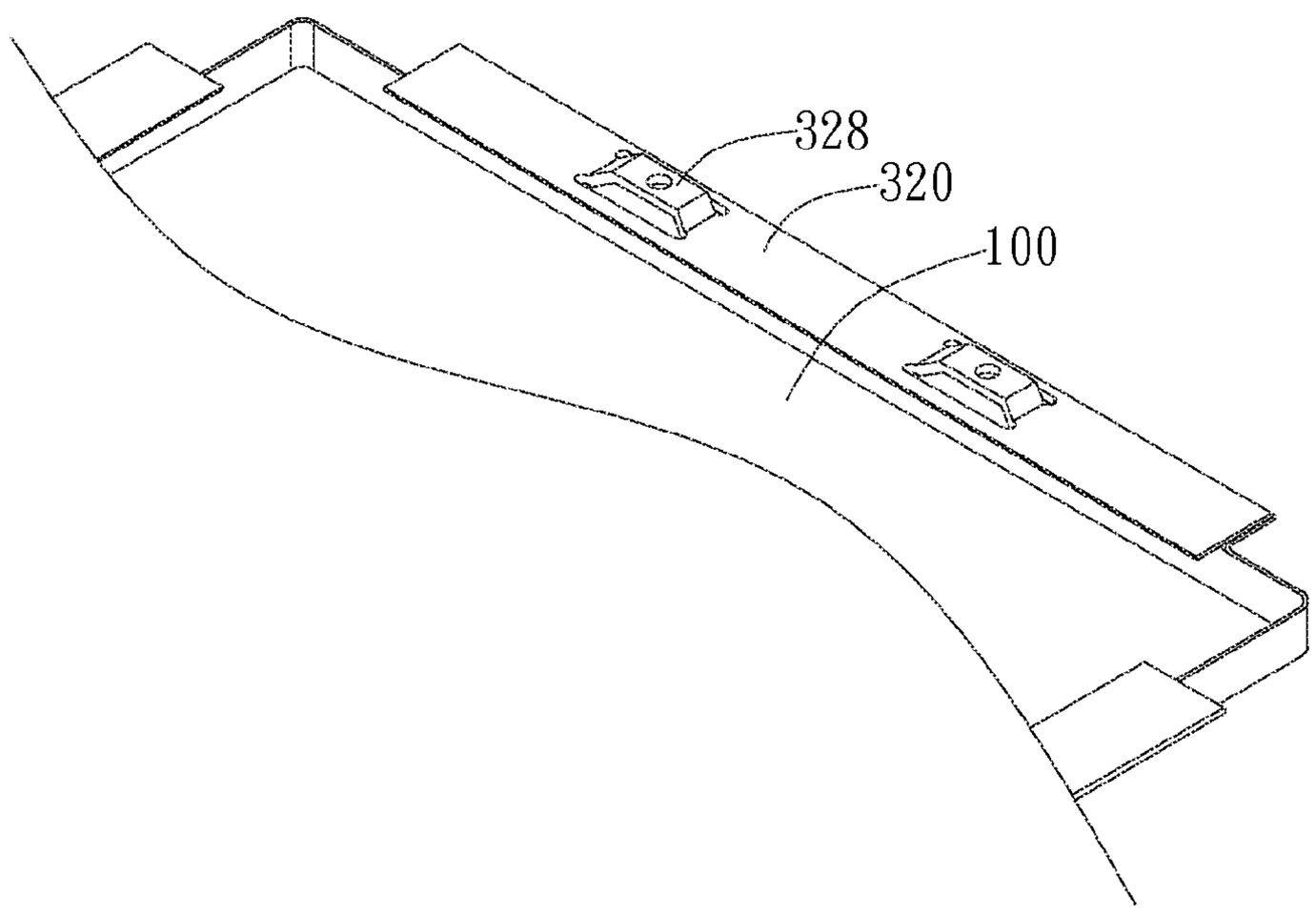


FIG. 2B

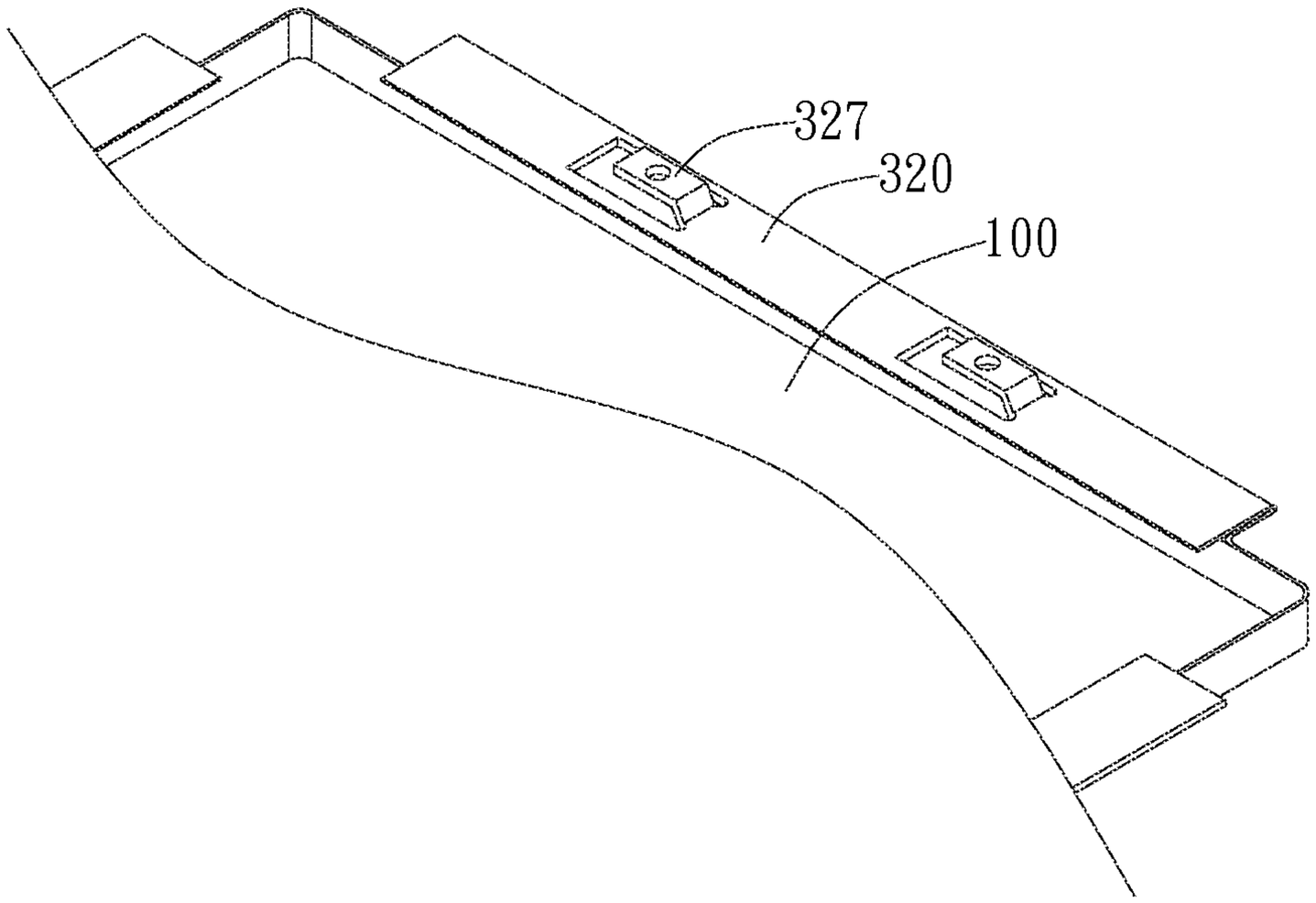


FIG. 2C

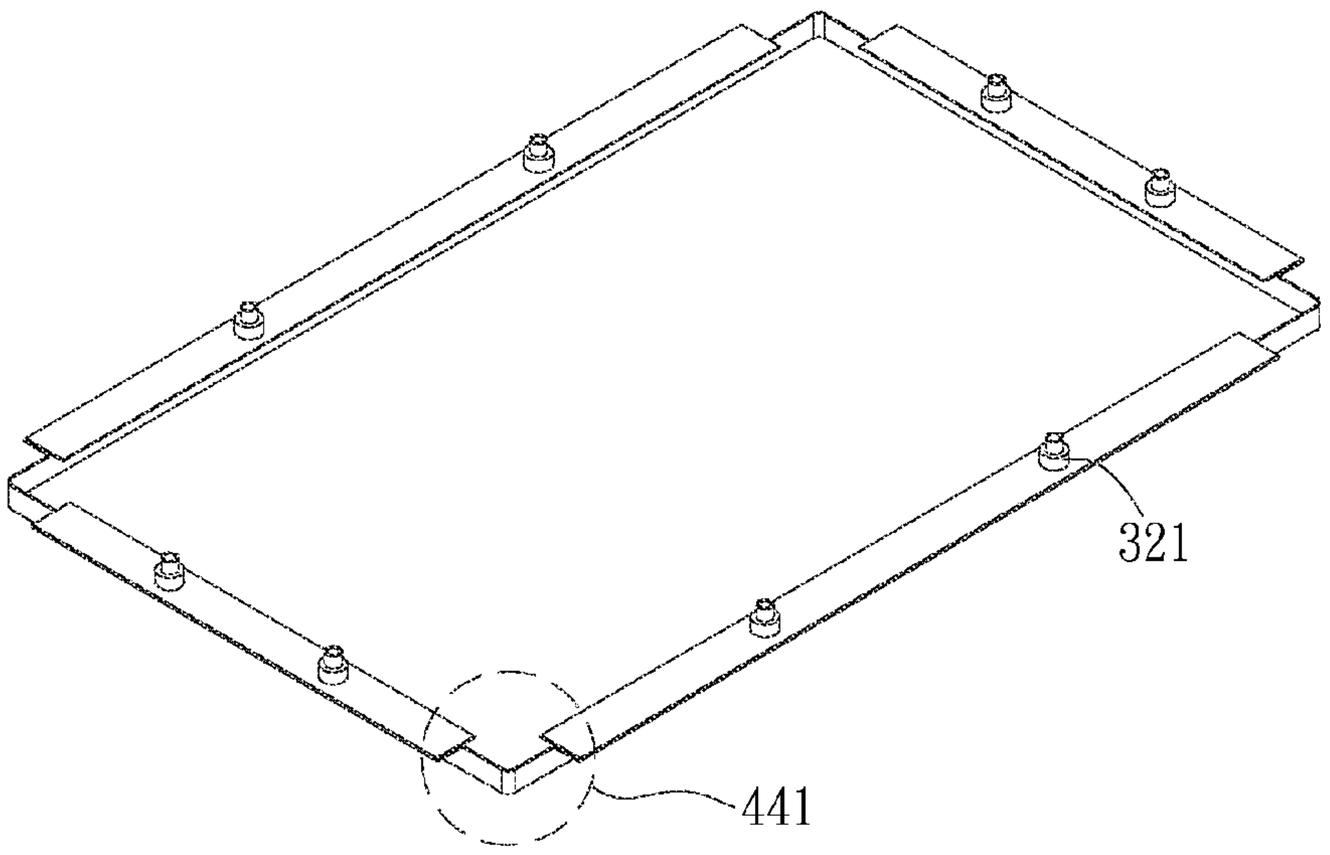


FIG. 3A

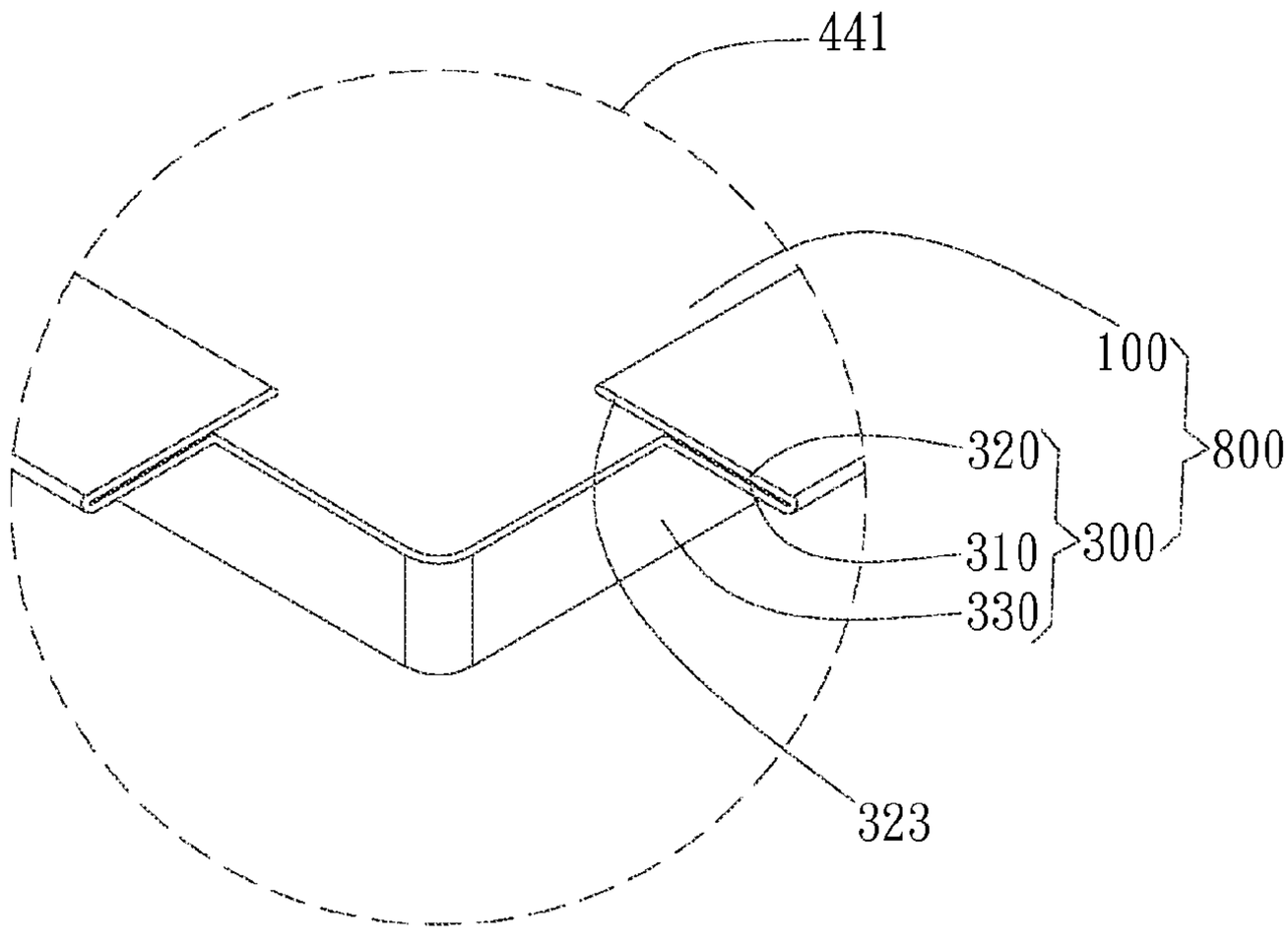


FIG. 3B

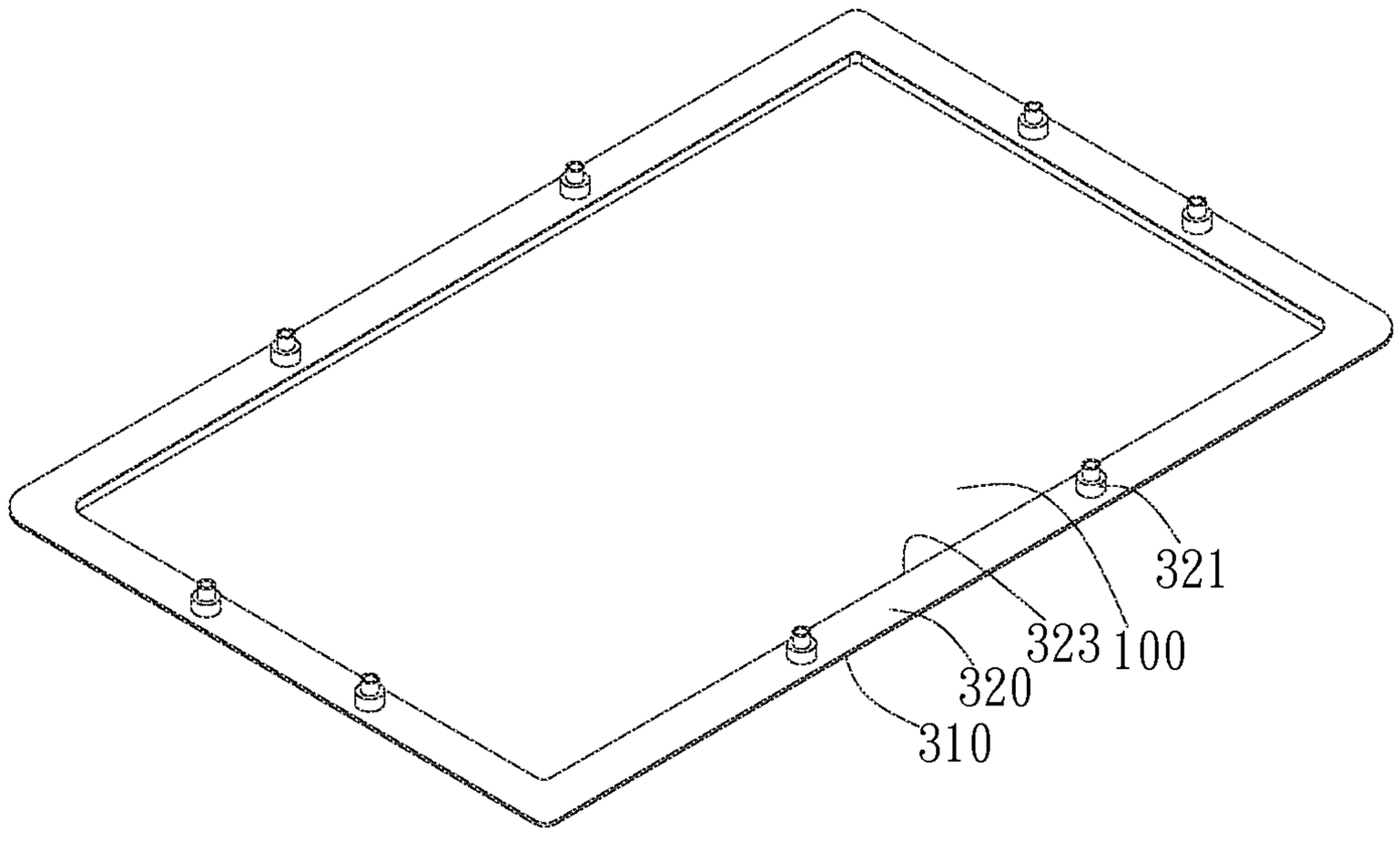


FIG. 3C

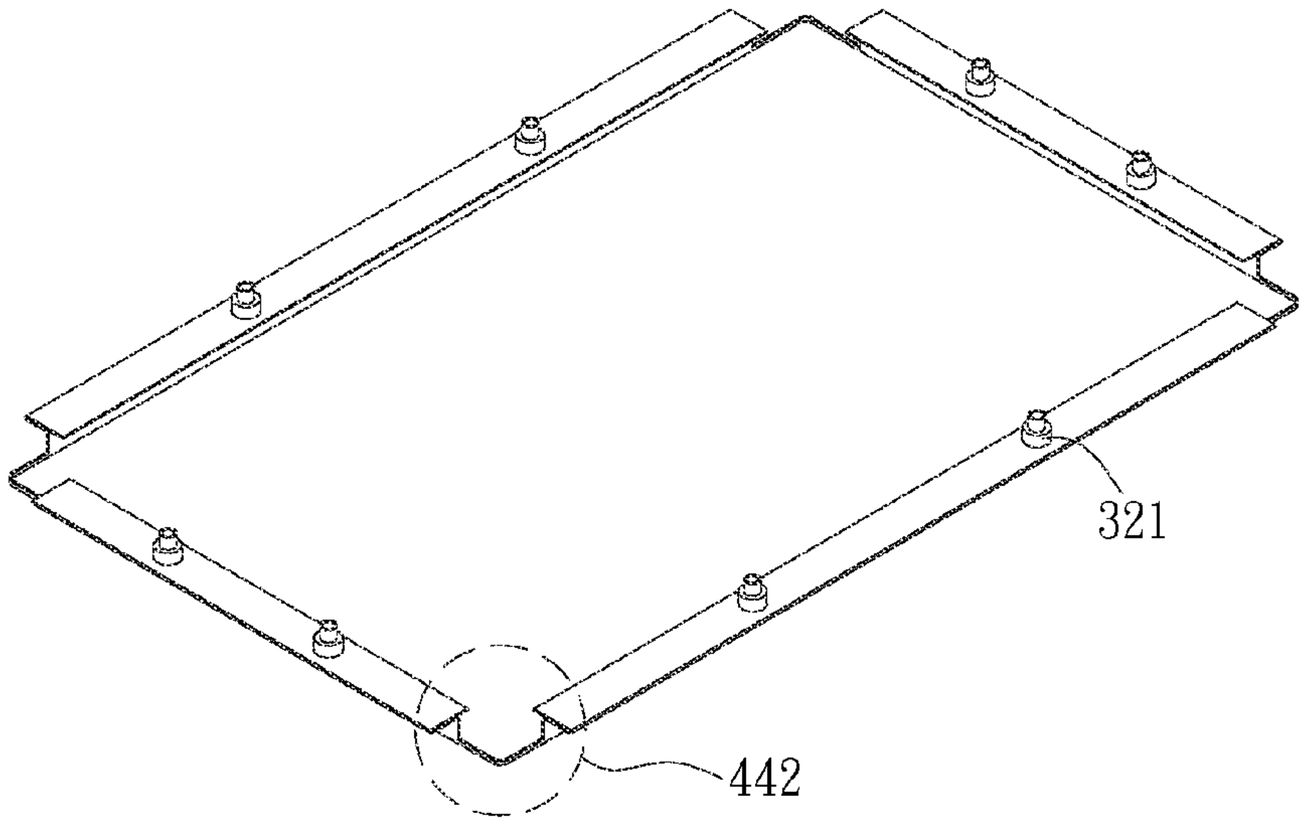


FIG. 4A

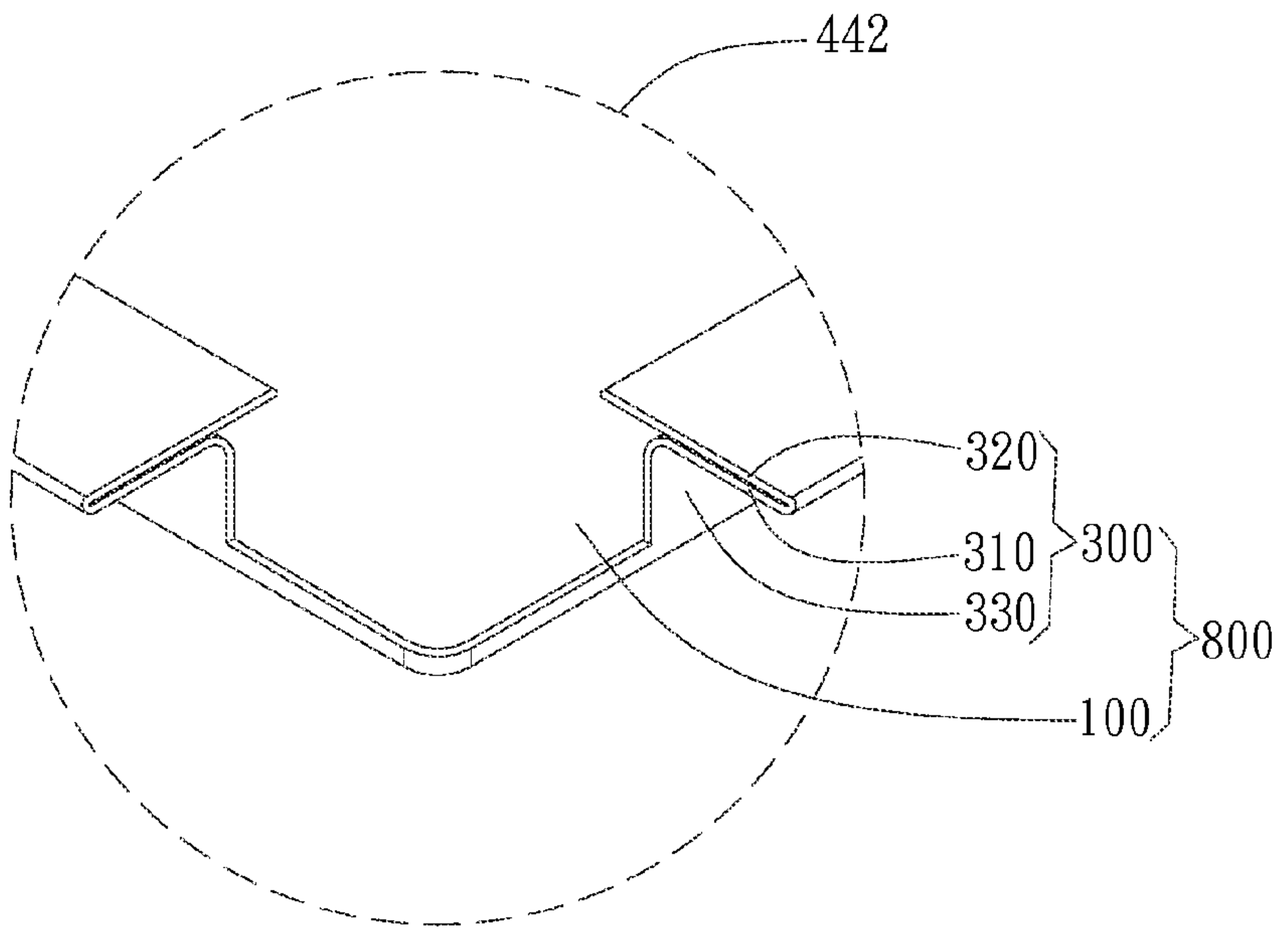


FIG. 4B

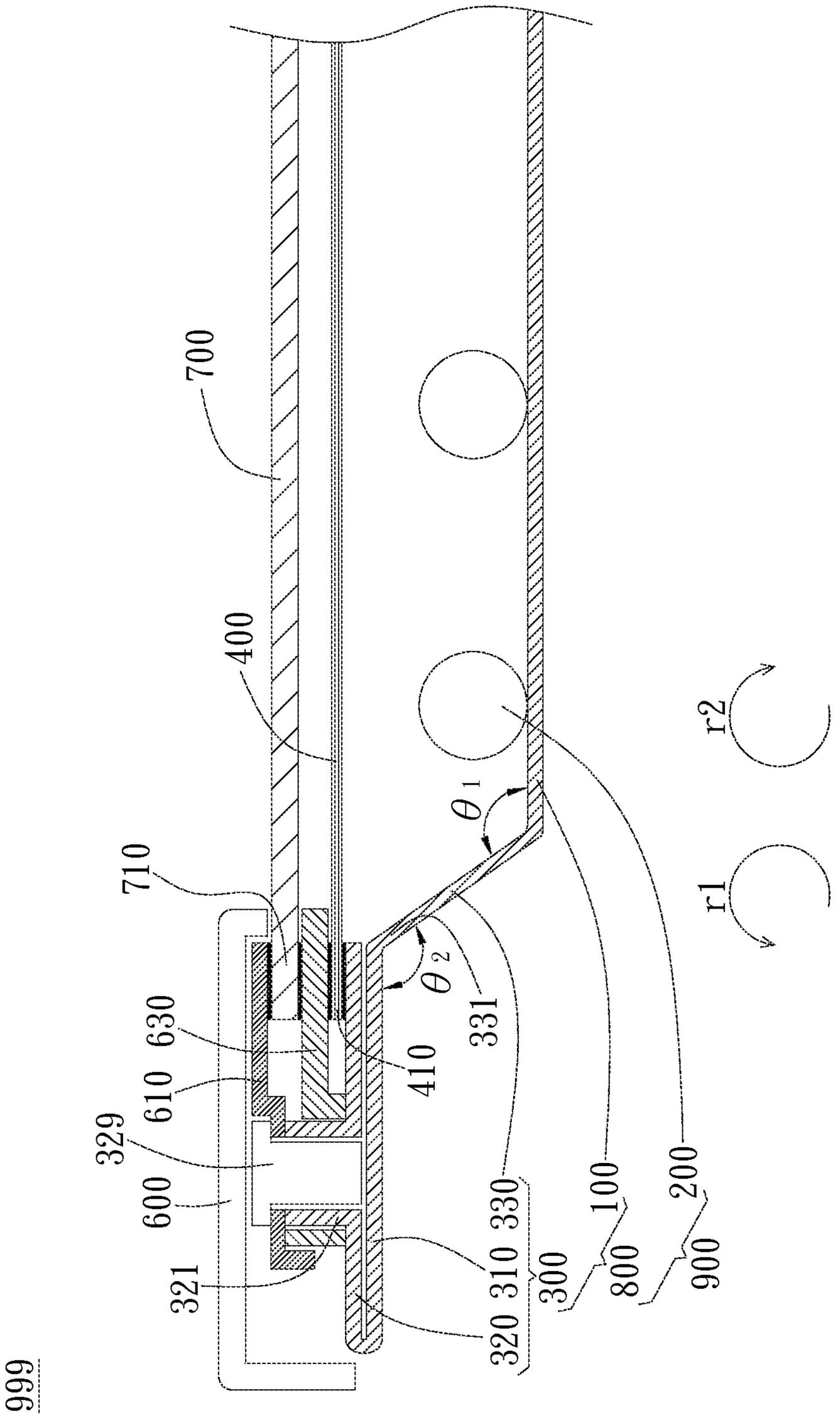

700
400
710
θ1
θ2
331
630
610
410
329
600
321
320 310 330
300
100
800
200
900
r1
r2
999

FIG. 5A

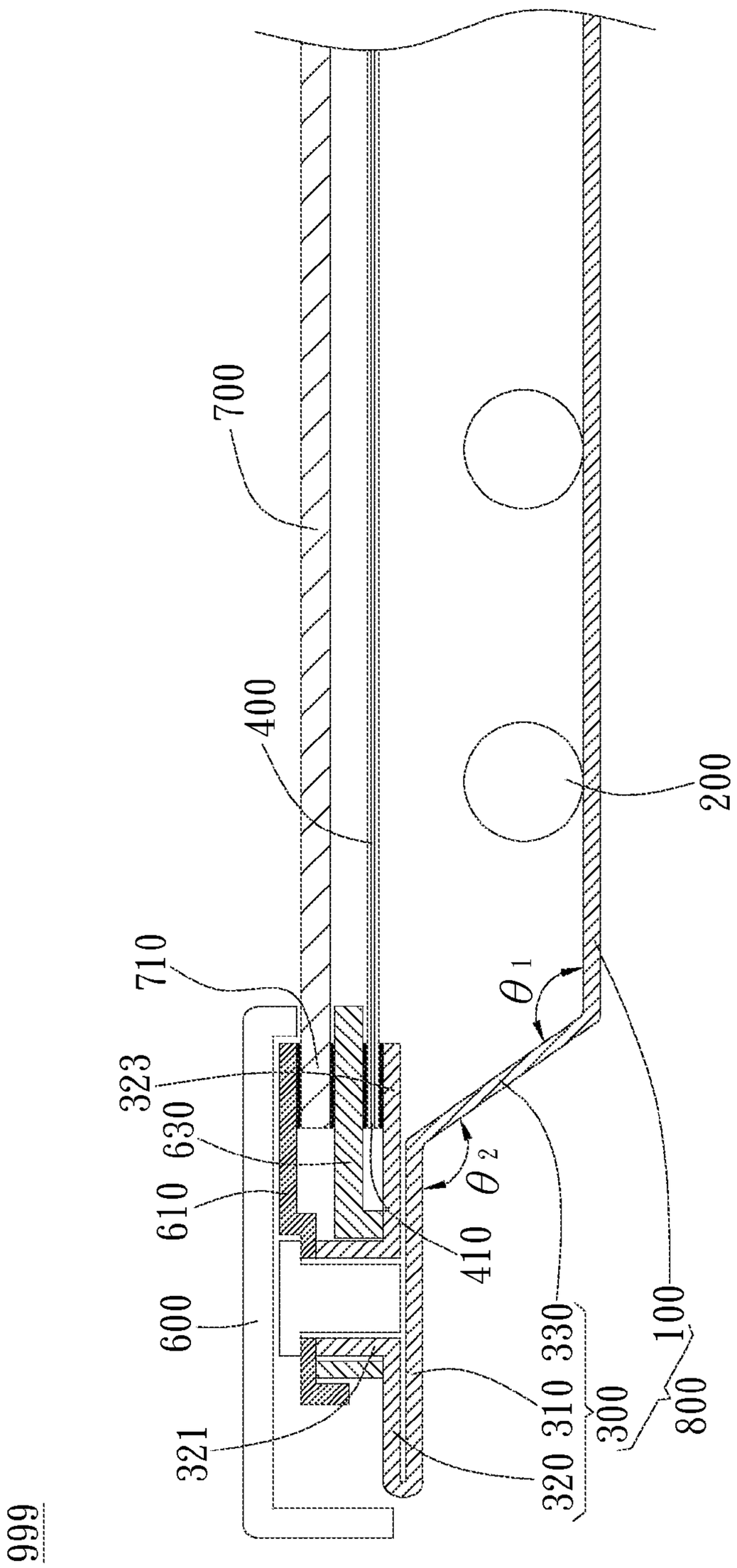

999
323
710
630
610
600
321
700
400
200
θ_1
θ_2
410
320
310
330
300
100
800

FIG. 5B

BACK PLATE, BACKLIGHT MODULE USING THE BACK PLATE AND DISPLAY DEVICE USING THE SAME

BACKGROUND OF THE DISCLOSURE

1. Field of the Disclosure

This disclosure generally relates to a back plate, a backlight module using the back plate and a display device using the same.

2. Background

Recently, the demand of LCD displays increases rapidly due to thin thickness, light weight, high portability, and low radiation of LCD panel in comparison with CRT displays. For large panel type, to show difference and reducing manufacturing cost for lowering the price, direct backlight design is commonly used. Besides, the thickness is properly increased, wherein the number of light source or optical films is decreased. On the other hand, the back plate is used as an external appearance part to decrease the volume of the plastic back cover, wherein an effect of reducing local thickness can also be achieved. However, narrow border types are main stream in the market, even the low price products are desired to have narrow border for better sale.

Tapping and/or bulkhead structures are not easily designed for using the back plate as an external appearance part. In present, rivets are used to fix inner units such as plastic bars and metal parts. More particularly, rivets are driven into the back plate from the back side to fix the plastic bars and metal parts, and further clamps the panel and the optical films. However, this approach increases the cost. Moreover, rivets are still visible in the back side of the back plate and are not able to be fully hidden from the view even a higher-cost rear spray coating is used, hence the aesthetic perception of the appearance is affected.

SUMMARY

In accordance with aspects of the present disclosure, a back plate for use with a backlight module having better aesthetic perception of the appearance is provided.

In accordance with embodiments of the present disclosure, a back plate for use with a backlight module is provided, wherein the position of a wall body of the back plate can be disposed more outward to prevent an overlapping of the projections of a visible area and the wall body in a direction vertical to a plate of the back plate.

The back plate includes a plate and a side wall. The side wall extends out from an edge of the plate, wherein the side wall includes a wall body, a first bending sheet, and a second bending sheet. A first angle is included between the wall body and the plate. The first bending sheet is formed by bending outward from a top end of the wall body along a first rotating direction, wherein a second angle is included between the first bending sheet and the wall body. The second bending sheet is formed by bending an end of the first bending sheet that is away from the top end of the wall body inward along a second rotating direction contrary to the first rotating direction, wherein the second bending sheet is substantially parallel to the first bending sheet and at least a portion of the second bending sheet overlaps the first bending sheet. The second bending sheet includes a fixing part disposed at the portion of the second bending sheet overlapping the first bending sheet and on a face of the second bending sheet that faces away from the first bending sheet.

The fixing part protrudes outward from the face of the second bending sheet that faces away from the first bending sheet. The first angle is 90° or obtuse. The second angle is 90° or obtuse. The wall body is substantially a continuous wall surrounding the plate. The wall body includes non-continuous walls disposed in pair on two opposite sides of the plate.

The present disclosure also provides a backlight module comprising the above described back plate and a light source module disposed on the plate. The backlight module further includes an optical film disposed on a face of the second bending sheet that faces away from the first bending sheet, wherein a side edge of the optical film extends outward and beyond the wall body. The display device of the present disclosure includes the above mentioned backlight module and a panel disposed on a face of the optical film that faces away from the second bending sheet, wherein a side edge of the panel extends outward and beyond the wall body. The display device further includes a casing part surrounding the back plate, wherein the casing part is fixed on the second bending sheet by the fixing part, wherein the panel is disposed between the casing part and the second bending sheet. The display device further includes a plastic frame disposed between the casing part and the second bending sheet, wherein the panel is disposed between the casing part and the plastic frame, wherein the optical film is disposed between the plastic frame and the second bending sheet.

An end of the second bending sheet opposite to the end of the second bending sheet connected to the first bending sheet extends beyond the wall body to form a supporting flange. The optical film is disposed on a face of the second bending sheet that faces away from the first bending sheet, wherein a side edge of the optical film is stacked on the supporting flange. The panel is disposed on a face of the optical film that faces away from the second bending sheet, wherein a side edge of the panel is stacked on the supporting flange.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view of the present disclosure;

FIG. **2**A is a schematic view of the present disclosure having a convex hull as the fixing part;

FIG. **2**B is a schematic view of the present disclosure having an arch bridge as the fixing part;

FIG. **2**C is a schematic view of the present disclosure having an N-folding as the fixing part;

FIG. **3**A is a schematic view of the present disclosure having a wall body surrounding the plate which is substantially a continuous wall;

FIG. **3**B shows a partially enlarged view of FIG. **3**A;

FIG. **3**C is a schematic view of the present disclosure having continuous first bending sheet and second bending sheet.

FIG. **4**A is a schematic view of the present disclosure having a wall body constituted by non-continuous walls disposed in pair on two opposite sides of the plate which is formed;

FIG. **4**B shows a partially enlarged view of FIG. **4**A;

FIG. **5**A is a schematic view of an embodiment of the present disclosure; and

FIG. **5**B is a schematic view of another embodiment of the present disclosure.

DETAILED DESCRIPTION

The back plate of the present disclosure is for use in a backlight module. In the preferred embodiment, the backlight module is for use in LCD display devices. In different embodiments, however, the backlight module is also avail-

able for use with keyboards, mobile phone button panels, billboards, and other devices using flat light source.

As the embodiment shown in FIG. **1**, the back plate **800** of the present disclosure includes a plate **100** and a side wall **300**. The side wall **300** extends out from an edge of the plate **100**, wherein the side wall **300** includes a wall body **330**, a first bending sheet **310**, and a second bending sheet **320**. A first angle θ_1 is included between the wall body **330** and the plate **100**, wherein the first angle θ_1 is 90° or obtuse. The first bending sheet **310** is formed by bending outward from a top end **331** of the wall body **330** along a first rotating direction r**1**, wherein a second angle θ_2 is included between the first bending sheet **310** and the wall body **330**. The second angle θ_2 is 90° or obtuse. The second bending sheet **320** is formed by bending an end of the first bending sheet **310** that is away from the top end **331** of the wall body **330** inward along a second rotating direction r**2** contrary to the first rotating direction r**1**, wherein the second bending sheet **320** is substantially parallel to the first bending sheet **310** and at least a portion of the second bending sheet **320** overlaps the first bending sheet **310**. Accordingly, the structure strength of the back plate **800** can be strengthened.

More particularly, in the preferred embodiment, the edge of the plate **100** is bent to form the wall body **330** along the second rotating direction r**2** by plate bending or rolling, followed with bending the wall body **330** that connects with the plate **100** outward along the first rotating direction r**1** to form the first bending sheet **310**, and then bending the other end of the first bending sheet **310** connecting with the wall body **330** inward along the second rotating direction r**2** to form the second bending sheet **320**. The wall body **330**, the first bending sheet **310**, and the second bending sheet **320** together form the side wall **300**. Taking a different point of view, the wall body **330** surrounds and stands on the edge of the plate **100** and forms a concave part with the plate **100**. The upper edge of the wall body **300** extends outward to form the first bending sheet **310** and the second bending sheet **320** which are parallel and at least partially overlapped.

As the preferred embodiment shown in FIG. **1**, the second bending sheet **320** includes a fixing part **321** disposed at the portion of the second bending sheet **320** overlapping the first bending sheet **310** and on a face of the second bending sheet **320** that faces away from the first bending sheet **310**. As the preferred embodiment shown in FIG. **1**, the fixing part **321** protrudes outward from the face of the second bending sheet **320** that faces away from the first bending sheet **310**. The fixing part **321** is preferably a rivet hole for a rivet **329** to be inserted thereinto and fix the casing part **610** (see FIG. **5**A) with the second bending sheet **320**. In this manner, the back plate **800** of the present disclosure and the casing part **610** can be fixed together without using rivets driven into the back plate from the back side mentioned in prior arts. In other words, there won't be any riveting seen from the back side of the back plate, hence the aesthetic perception of the appearance of the back plate **800** of the present disclosure would be better. In different embodiments, to satisfy manufacturing or design requirements, the fixing part **321** could be a convex hull **326** shown in FIG. **2**A, an arch bridge **328** shown in FIG. **2**B, or an N-folding **327** shown in FIG. **2**C.

As the preferred embodiment shown in FIGS. **3**A and **3**B, the wall body **330** is substantially a continuous wall surrounding the plate **100**. Accordingly, the structure strength of the back plate **800** can be strengthened. Though the wall body **330** is a continuous wall, the outward extended first bending sheet **310** and second bending sheet **320** could be non-continuous as shown in FIGS. **3**A and **3**B to satisfy manufacturing or design requirements or to decrease manufacturing cost. In different embodiments, the outward extended first bending sheet **310** and second bending sheet **320** could be continuous as shown in FIG. **3**C to strengthen the structure strength of the first bending sheet **310** and the second bending sheet **320**. On the other hand, the wall body **330** could be non-continuous to satisfy manufacturing or design requirements or to decrease manufacturing cost. As a different embodiment shown in FIGS. **4**A and **4**B, the wall body **330** includes non-continuous walls disposed in pair on two opposite sides of the plate **100**.

As an embodiment shown in FIG. **5**A, the backlight module **900** of the present disclosure includes the back plate **800** and a light source module **200** disposed on the plate **100**. The backlight module **900** further includes an optical film **400** disposed on a face of the second bending sheet **320** that faces away from the first bending sheet **310**, wherein a side edge **410** of the optical film **400** extends outward and beyond the wall body **330**. More particularly, the optical film **400** is disposed above the back plate **800**, wherein its edge **410** extends outward from the center of the backlight module **900** and beyond the wall body **330**, and is supported by the second bending sheet **320**. The optical film could be a diffuser, a brightness enhancing film, a polarizing film, etc., wherein the number of the optical film is not limited to one.

As shown in FIG. **5**A, the display device **999** of the present disclosure includes the backlight module **900** and a panel **700** disposed on a face of the optical film **400** that faces away from the second bending sheet **320**, wherein a side edge **710** of the panel **700** extends outward and beyond the wall body **330**. The display device **999** further includes a casing part **610** surrounding the back plate **800**, wherein the casing part **610** is fixed on the second bending sheet **320** by the fixing part **321**, wherein the panel **700** is disposed between the casing part **610** and the second bending sheet **320**. The display device **999** further includes a plastic frame **630** disposed between the casing part **610** and the second bending sheet **320**, wherein the panel **700** is disposed between the casing part **610** and the plastic frame **630**, wherein the optical film **400** is disposed between the plastic frame **630** and the second bending sheet **320**. More particularly, the panel **700** is disposed above the back plate **800** and the optical film **400**, wherein the side edge **710** of the panel **700** extends outward and beyond the wall body **330** from the center of the backlight module **900**. The side edge **710** of the panel **700** at least partially overlaps the side edge **410** of the optical film **400** with the plastic frame **630** interposed therebetween. By inserting the rivet **329** into the fixing part **321**, the casing part **610** is fixed with the second bending sheet **320**, wherein the side edge **710** of the panel **700**, the plastic frame **630**, and the side edge **410** of the optical film **400** disposed between the casing part **610** and the second bending sheet **320** are clamped and fixed. On the other hand, since the fixing part **321** is able to support the casing part **610**, the height of the fixing part **321** can be modified to match the thickness of the panel **700** and the optical film **400** considering the design and manufacturing requirements. On the other hand, the display device **999** of the present disclosure further includes a front frame **600** disposed on the casing part **610** for preventing the exposure of units such as rivet **329**.

As the embodiment shown in FIG. **5**B, an end of the second bending sheet **320** opposite to the end of the second bending sheet **320** connected to the first bending sheet **310** extends beyond the wall body **330** to form a supporting flange **323**. In the embodiment, optical film **400** is disposed on a face of the second bending sheet **320** that faces away from the first bending sheet **310**, wherein a side edge **410** of the optical film **400** is stacked on the supporting flange **323**. The panel **700** of the display device **999** is disposed on a face of the optical film **400** that faces away from the second bending sheet **320**, wherein

a side edge **710** of the panel **700** is stacked on the supporting flange **323** and preferably does not extend beyond the wall body **330**. For carrying same size of panel **700** and optical film **400**, by disposing the supporting flange **323**, the position of a wall body **330** can be disposed more outward to prevent an overlapping of the projections of a visible area and the wall body **330** in a direction vertical to the plate **100** and to decrease the abnormal of displaying. On the other hand, the supporting flange **323** is able to prevent light leakage.

Although the preferred embodiments of the present disclosure have been described herein, the above description is merely illustrative. Further modification of the disclosure herein disclosed will occur to those skilled in the respective arts and all such modifications are deemed to be within the scope of the disclosure as defined by the appended claims.

What is claimed is:

1. A back plate for use with a backlight module, comprising:

a plate; and

a side wall extending out from an edge of the plate, the side wall including:

a wall body, wherein a first angle is included between the wall body and the plate;

a first bending sheet formed by bending outward from a top end of the wall body along a first rotating direction, wherein the first bending sheet is substantially parallel to the plate, and a second angle is included between the first bending sheet and the wall body; and

a second bending sheet formed by bending an end of the first bending sheet that is away from the top end of the wall body inward along a second rotating direction contrary to the first rotating direction, wherein the second bending sheet is substantially parallel to the first bending sheet and at least a portion of the second bending sheet overlaps the first bending sheet, wherein the second bending sheet includes a fixing part disposed at the portion of the second bending sheet overlapping the first bending sheet and on a face of the second bending sheet that faces away from the first bending sheet,

wherein the wall body is substantially a continuous wall surrounding the plate or includes non-continuous walls disposed in pair on two opposite sides of the plate.

2. The back plate of claim **1**, wherein the fixing part protrudes outward from the face of the second bending sheet that faces away from the first bending sheet.

3. The back plate of claim **1**, wherein the first angle is 90° or obtuse.

4. The back plate of claim **1**, wherein the second angle is 90° or obtuse.

5. The back plate of claim **1**, wherein an end of the second bending sheet opposite to where the end of the second bending sheet is connected to the first bending sheet extends beyond the wall body to form a supporting flange.

6. A backlight module, comprising:

the back plate of claim **1**; and

a light source module disposed on the plate.

7. The backlight module of claim **6**, further comprising an optical film disposed on a face of the second bending sheet that faces away from the first bending sheet, wherein a side edge of the optical film extends outward and beyond the wall body.

8. A display device, comprising:

the backlight module of claim **7**; and

a panel disposed on a face of the optical film that faces away from the second bending sheet, wherein a side edge of the panel extends outward and beyond the wall body.

9. The display device of claim **8**, further comprising a casing part surrounding the back plate, wherein the casing part is fixed on the second bending sheet by the fixing part, wherein the panel is disposed between the casing part and the second bending sheet.

10. The display device of claim **9**, further comprising a plastic frame disposed between the casing part and the second bending sheet, wherein the panel is disposed between the casing part and the plastic frame, wherein the optical film is disposed between the plastic frame and the second bending sheet.

11. A backlight module, comprising:

the back plate of claim **5**; and

a light source module disposed on the plate.

12. The backlight module of claim **11**, further comprising an optical film disposed on a face of the second bending sheet that faces away from the first bending sheet, wherein a side edge of the optical film is stacked on the supporting flange.

13. A display device, comprising:

the backlight module of claim **12**; and

a panel disposed on a face of the optical film that faces away from the second bending sheet, wherein a side edge of the panel is stacked on the supporting flange.

14. The display device of claim **13**, further comprising a casing part surrounding the back plate, wherein the casing part is fixed on the second bending sheet by the fixing part, wherein the panel is disposed between the casing part and the second bending sheet.

15. The display device of claim **14**, further comprising a plastic frame disposed between the casing part and the second bending sheet, wherein the panel is disposed between the casing part and the plastic frame, wherein the optical film is disposed between the plastic frame and the second bending sheet.

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